

# Course Description, BIOL\*3010, Fall 2014

## Laboratory & Field Work in Ecology, Department of Integrative Biology

### I. General Information

**Course Description:** This course is designed to help students formulate and critically evaluate research questions about ecological processes, plan studies to answer these questions and communicate the results of these studies. Students will gain experience in experimental design, sampling, data analysis, and interpretation of data. Local field sites will be used for research. There is considerable emphasis on group decision-making and individual writing in this course because we want you to practice critical thinking and communication skills as well as use the process of writing to evaluate the logic of ideas. Student evaluation is based on project reports, a laboratory notebook and peer reviews. Credits: 0.50. Prerequisite(s): BIOL\*2060, (STAT\*2040 or STAT\*2230). Restriction(s): This is a Priority Access Course. Enrolment may be restricted to particular programs (WBC and ECOL majors), specializations or semester levels during certain periods. Please see the BSc Academic Advising website: <http://www.bsc.uoguelph.ca/> for more information.

Credit weight: 0.5

Prerequisites: BIOL\*2060, (STAT\*2040 or STAT\*2230)

#### Teaching Team:

Instructors: Dr. Hafiz Maherali, SSC 1472, x52767, [maherali@uoguelph.ca](mailto:maherali@uoguelph.ca)  
Dr. D. Ryan Norris, SSC 2451, x56300, [rnorris@uoguelph.ca](mailto:rnorris@uoguelph.ca)

Office hours: The nature of this course means that there will be ample opportunity to consult with instructors during class time. Meetings with instructors outside of class time can be scheduled by appointment.

Teaching assistants: Michael Rogers, [mroger05@uoguelph.ca](mailto:mroger05@uoguelph.ca)

#### Course meeting times:

Laboratories: T, Th 08:30 – 09:50, SSC 2306  
W 14:30 – 17:20, SSC 2306

### II. Course Goals

#### Learning Outcomes

1. Distinguish mechanistic research (why/how is it there?) from descriptive research (who/what is there?).
2. Apply the scientific method, and gain facility with making observations, sampling techniques, and hypothesis and prediction development.
3. Use your understanding of ecological processes from prior courses (BIOL\*2060) to create a research study that advances understanding about an ecological processes in a local natural system.
4. Critically evaluate the scientific and societal value of potential research questions.

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5. Analyse scientific literature in order to motivate and contextualize your research question, hypotheses and conclusions.
6. Incorporate uncertainty during the design and implementation of a research study. This means measuring, testing, accounting for, and acknowledging uncertainty throughout the scientific process.
7. Use prior knowledge from statistics courses (STAT\*2040 or STAT\*2230) to summarize, compare and communicate patterns in collected data and evaluate the quality of evidence.
8. Practice logic- and evidence-based approaches to reach defensible conclusions.
9. Collaborate to identify and answer research questions.
10. Constructively critique your work and that of your peers and revise your work based on the constructive criticism of your peers and instructors.
11. Communicate science effectively by writing about your original research contribution. Practice writing ‘with the reader in mind’, including mastery of structural and grammatical tools to effectively communicate the rationale and importance of your study, and the implications of your findings.

**III. Course Content**

**Learning Methods**

Students are immersed in performing and communicating original ecological research of their choice (subject to logistic limitations). There are no traditional lectures or labs (i.e., there is no real distinction between what we do during Tuesday/Thursday and Wednesday periods). Students can expect up to 6 contact hours per week with faculty and/or teaching assistants, and to invest a total of 15 hours per week designing, conducting and writing reports on class research projects. Class time will be devoted to discussions and exercises supporting critical thinking and problem solving (two important aspects of original scientific inquiry) and scientific writing. Specifically, students will develop and carry out collaborative ecological studies involving collection and analysis of original data, and manuscript writing.

**Schedule of Topics**

Due to the nature of the course, this schedule is subject to change to adapt to the needs of student-driven research projects. This document will be revised as needed and posted on the course website.

Unless otherwise noted, the chapters and pages in the assigned reading refer to the course textbook.

Date	Day	Topic	Assigned reading
Sept. 04	Th	Introduction to course; What are we doing here? What is Science? How do Ecologists do Science?	
Sept. 09	Tu	What are the professional expectations for and skills of an Ecologist? Why is communication and collaboration important?	“The Good Eye” reading Arboretum map

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		Introduction to the art of observation.	Posted to courselink
Sept. 10	W	Field trip to the Arboretum, make observations and propose hypotheses. Arboretum website: <a href="http://www.uoguelph.ca/arboretum">http://www.uoguelph.ca/arboretum</a>	"Picking a Question" reading URL: <a href="http://press.princeton.edu/chapters/s10284.pdf">http://press.princeton.edu/chapters/s10284.pdf</a>
Sept. 11	Th	Workshop: What makes a good research question? Workshop & Brainstorm: What are your research questions? Develop and critique a 'long' list of research questions.	List of questions posted to courselink
Sept. 16	Tu	Form groups around specific questions (5-7 students per group). A group should have more than one question in mind (primary and back-ups). Develop a plan to collect preliminary data, which could include i) quantitative observations to verify a pattern you observed and/or ii) a pilot project to see if your question is feasible.  Submit your plan to instructors by the end of class. You will get feedback before Wednesday's lab.	Chapter 2: "Searching the Literature" Chapter 9: "Reading & Critiquing a Scientific Article"
Sept. 17	W	Field trip to Arboretum. Do the field work you planned on Tuesday!	
Sept. 18	Th	Brainstorm: What did you learn while trying to implement your plan? Workshop: Refine your research question through discussion with your group and consultation of literature, instructors will offer feedback.  <b>Assignment 1, for Sept. 21:</b> Each student will submit an annotated bibliography of 3 references related to their research question via the class discussion board.	Appendix C (a tutorial on using MS-EXCEL).  List of available equipment posted to course website.
Sept. 23	Tu	Refine your hypotheses within your group, using the literature you discovered over the weekend.  <b>Assignment 2 due:</b> At the end of class, each group must submit a refined hypothesis, prediction, methods for Wednesday's lab, draft data sheet, each person's planned contribution to the data collection effort and a list of required equipment.  We will make a copy for your group to keep. Instructors will provide feedback for Wednesday.	
Sept. 24	W	Try out your proposed methods; record your data and develop a plan for sharing your data with your group.	How to set up a shared google

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			document or spreadsheet: <a href="https://support.google.com/docs/answer/49008">https://support.google.com/docs/answer/49008</a>
Sept. 25	Th	<p>“The best laid schemes of mice and men / Often go awry” – Robert Burns.</p> <p>Class discussion: What went wrong? What needs to be revised? What went well?</p> <p>Revise hypotheses, predictions, methods based on yesterday’s field experience.</p> <p><b>Assignment 3 due on Sept. 30:</b> Group proposal with short background, hypotheses, predictions, graphs of expected relationships between variables, datasheet, and references, due at the beginning of class.</p> <p>Sign-up sheet for oral presentations available.</p>	
Sept. 30	Tu	<p><b>Assignment 3 Oral presentations: LAB MEETING!</b></p> <p>Student presentations to the class. Each group will present a talk to the rest of the class that describes: The background, the research question, the hypothesis, the prediction (use a graph), the methods, the data collection plan. 8 minute presentation followed by 7 minute discussion.</p> <p>All students are expected to attend and provide constructive criticism, evidence of which must be found in your lab books.</p>	
Oct. 01	W	Data collection in the field	
Oct. 02	Th	<b>Assignment 3 Oral presentations continue</b>	
Oct. 07	Tu	Workshop: How to write the Introduction of a scientific paper.	<p>“The Science of Scientific Writing” Reading posted to courselink. Chapters 1, 3 &amp; 4; Comments on your writing will reference these chapters.</p>
Oct. 08	W	Data collection. Instructors will be available in the field for consultation and to distribute equipment as needed.	
Oct. 09	Th	Instructors available for consultation. One 10 minute	

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		<p>appointment available for each group.</p> <p>If consultation not needed, groups should be in the field collecting data.</p>	
Oct. 14	Tu	Thanksgiving reading break. No class meeting today.	
Oct. 15	W	Fieldwork; data collection. Instructors will be available in the field for consultation and to distribute equipment as needed.	
Oct. 16	Th	<p><b>Assignment 4: Introduction section of the paper is due at the beginning of class.</b></p> <p>Workshop: How to write the Methods of a scientific paper.</p>	<p>Review Chapters 1-4; Chapters 6-8.</p> <p>Comments on your writing will reference these chapters.</p>
Oct. 21	Tu	Fieldwork; data collection. Instructors will be available in the field for consultation and to distribute equipment as needed.	
Oct. 22	W	Fieldwork; data collection. Instructors will be available in the field for consultation and to distribute equipment as needed.	
Oct. 23	Th	<p><b>Assignment 5: Methods section of the paper is due at the beginning of class.</b></p> <p>Feedback on the Introduction section.</p> <p>Instructors available for consultation. If consultation not needed, groups should be in the field collecting data.</p>	
Oct. 28	Tu	Fieldwork; data collection. Instructors will be available in the field for consultation and to distribute equipment as needed.	
Oct. 29	W	Fieldwork; last day of data collection. All materials removed from the field and equipment returned.	
Oct. 30	Th	<p>Workshop: How to write the Results section of a scientific paper.</p> <p>Feedback on the Methods section.</p>	
Nov. 04	Tu	<p><b>Revised Introduction + Methods due for peer review. An Introduction + Methods section must be submitted in order to participate in Assignment 6.</b></p> <p>Class discussion: What is peer review? How do Ecologists use peer review to improve science?</p>	Consult assignment instructions posted to the course website.
Nov. 05	W	<p>Data analysis workshop!</p> <p>All group members are expected to attend their scheduled workshop.</p>	

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Nov. 06	Th	Data analysis and peer review consultation as needed.	
Nov. 11	Tu	<b>Assignment 6: Peer reviews due, submitted through PEAR.</b> Data analysis consultation as needed.	
Nov. 12	W	Data analysis consultation as needed.	
Nov. 13	Th	Instructors available for consultation.	
Nov. 18	Tu	<b>Assignment 7: Results sections due at the beginning of class</b>  <b>Assignment 8: Lab books due at the beginning of class.</b>	
Nov. 19	W	<b>Lab Books Returned.</b> Instructors available for consultation.  LAB MEETING!  Student presentations to the class. Each group will present a talk to the rest of the class that describes: The background, the research question, the hypothesis, predictions, methods, results and conclusions.  All students are expected to attend and provide constructive criticism.	
Nov. 20	Th	Instructors available for consultation.	
Nov. 25	Tu	<b>Results sections returned with general feedback</b> Instructors available for consultation.	
Nov. 26	W	Constructive criticism and making proposals to solve problems.  Challenge: How would you improve this course? Oral proposals submitted through small group workshops.  Class will vote on the best solution and the group with the winning idea gets a prize!	
Nov 28	F	Last class day for BIOL 3010; Instructors available for consultation. Assessment of Peers due ( <b>Assignment 9</b> ).	
Dec. 10	W	<b>Assignment 10: Final papers due at 12 pm (noon).</b>	

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#### **IV. Course Resources**

##### **Course Textbook:**

Hofmann, A.H. 2013. Writing in the Biological Sciences. Oxford University Press. 290 pp.

This inexpensive guide is easy-to-use and cleverly designed. It contains information for good practices for writing, data analysis, and results presentation that will be useful for BIOL\*3010 as well as for all of your other science courses. Feedback on written work will be specifically linked to elements in this book and so will aid you in revisions of your work.

##### **Other resources for writing lab reports:**

Writing services at the University of Guelph Learning Commons:

[http://www.lib.uoguelph.ca/assistance/writing\\_services/](http://www.lib.uoguelph.ca/assistance/writing_services/)

**The purchase of a laboratory or similar notebook is required** so that you can record your progress while designing, pursuing and completing two research projects. Record in your research book:

- information about your collaborators and how to contact them
- all observations while in the lab and field and all data collected
- calculations for data analysis, preliminary and final graphical results
- references, analyses and summaries of relevant scientific literature that you will source and include in your written reports
- all of your thinking as you design your research question, hypotheses and predictions, methods, identify and solve problems throughout, interpret your statistical results and come to conclusions about your study.

Notebooks with graph paper for drawing graphs of analyzed data will be the most useful.

Laboratory notebooks will be graded in the last few weeks of the course. In general, everything that you have thought during the development, pursuit and completion of each of two research projects should be visible in your notebook. We will be looking for evidence of a 'narrative' that shows a beginning (e.g., goals/questions/hypotheses/predictions, etc.) – middle (method and pursuit of data and relevant literature, etc.) – and end (analyses, conclusions, uncertainties, etc.) to each project. The absence of these elements in your notebook will generally result in lower grades. Think of your notebook as a 'road map' roughly showing your engagement with and thinking about all aspects of your research. The more complete and expressive of YOUR creativity, the better.

Class notes will be posted to the course website when necessary.

#### **V. Methods of Assessment**

Evaluation will occur through written manuscripts describing research done, a laboratory notebook and performance on peer reviews of colleagues' writing.

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<u>Assignment</u>	<u>Allocation</u>	<u>Learning Objectives Addressed</u>
1. Annotated Bibliography	2%	1,2,3
2. Group research plan	3%	1,2,3,5,9
3. Group proposal + Oral presentation	5%	1,2,3,5,9,10
4. Introduction	10%	1, 2, 3, 4, 5, 6, 12
5. Methods	10%	1, 2, 5, 6, 7, 8, 9, 12
6. Peer Evaluation of Intro + Methods	10%	1, 2, 3, 5, 7, 8, 10, 11, 12
7. Results	10%	1, 3, 4, 5, 8, 9, 10, 11
8. Lab book	10%	2, 3, 4, 5, 7, 9,
9. Peer & self-assessment of participation	5%	10
10. Final Research Report	<u>35%</u>	1, 2, 3, 5, 7, 8, 10, 11, 12
	100%	

**Important dates**

First class	04 September
A1. Annotated Bibliography due	21 September
A2. Group research plan due	23 September
A3. Group proposal due	30 September
A3. Oral presentations	30 Sept and 02 Oct
A4. Introduction due	16 October
A5. Methods due	23 October
Fortieth class day	30 October
Introduction and Methods for peer review due	04 November
A6. Peer reviews of Introduction and Methods submitted to PEAR	11 November
A7. Results due	13 November
A8. Lab books due	18 November
A9. Peer evaluation of group due	28 November
A10. Final Research Report 2 due	10 December

**All assignments and the lab book are due IN CLASS on the due date. The Final Research Report is due on December 10th by 12 pm (noon).**

**VI. Course and University Policies**

The Academic Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs: <http://www.uoguelph.ca/registrar/calendars/index.cfm?index>

**Policy on Late Submissions**

All items are due on the dates shown by the specified time. Late submissions will be accepted, but will be penalized 10% if submitted up to midnight of the due date. For each subsequent day (24 hour period), submissions will incur a 20% penalty per day late, including weekends.



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#### **Policy on Field Safety**

We will be in at field sites around the University of Guelph campus and the City of Guelph (Dairy Bush, Brown's Wood, Arboretum, Speed and Eramosa Rivers) for a majority of laboratory periods. You are required to review the field safety protocols listed at the end of this course outline, and then sign the accompanying waiver which acknowledges that you have read the safety information, understand the risks, and agree to participate in the field laboratories. Students should always perform work in the field in groups of at least 2 students.

#### **When you are unable to meet a course requirement**

Students who miss exams or assignments will receive a grade of zero for that work (missed final exams automatically result in consideration by academic review). The grade will remain zero until the student is granted Academic Consideration from their program counsellor for documented medical or other legitimate, compassionate reasons for missing the assigned work. If you are unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, student ID number, and e-mail contact. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

If Academic Consideration is granted, the student will be permitted to submit the assigned work. No changes to the evaluation scheme will be made without written consent of all students in the course and approval of instructors. Unofficial deferments of any scheduled evaluation will not be granted.

#### **Drop Date**

The last date to drop one-semester courses, without academic penalty, for Fall 2014 is October 30, 2014. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

#### **Copies of out-of-class assignments**

Keep paper and/or other reliable back-up copies of all out-of-class assignments. You may be asked to resubmit work at any time.

#### **E-mail Communication**

As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly. E-mail is the official route of communication between the University and its students. All emails to course instructors must be sent from your <uoguelph.ca> e-mail account.

#### **Recording of Materials**

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

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#### **Academic misconduct and plagiarism**

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study. Faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:  
<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

The University policy on academic integrity ([www.academicintegrity.uoguelph.ca](http://www.academicintegrity.uoguelph.ca)) defines plagiarism as "...stealing and lying about it afterwards. It means using others' work and misrepresenting that work as your own without giving the author credit". Field work and data analysis will be done in groups and we therefore expect that many of you will use the same resources, share ideas and discuss how to interpret results. Doing shared work will help you learn, but you must not engage in plagiarism when submitting assignments. If we detect plagiarism, we will be forced to assign a grade of zero for the item and take other disciplinary action under university guidelines.

Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse your responsibility to verify the academic integrity of work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor. If in doubt - ASK!

#### **Course Evaluation information (from the CCS website)**

CCS now provides the U of G Online Course Evaluation System in a secure, online environment. End of semester course and instructor evaluations provide students the opportunity to have their comments and opinions form part of the information used by Promotion and Tenure Committees in evaluating the faculty member's contributions in the area of teaching.

Course evaluations are now conducted through this web site:

[https://courseeval.uoguelph.ca/CEVAL\\_LOGIN.php](https://courseeval.uoguelph.ca/CEVAL_LOGIN.php). Login with your central email account login ID and password: Occasionally course evaluations are conducted in class. Instructors do NOT receive evaluations until the end of exam period. Furthermore, evaluations are anonymous, unless you specifically indicate you want to acknowledge your comments

#### **Accessibility**

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the

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University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible. For more information, contact CSD at 519-824-4120 ext. 56208 or email [csd@uoguelph.ca](mailto:csd@uoguelph.ca) or see the website: <http://www.csd.uoguelph.ca/csd/>

#### **VII. Campus Resources**

##### **If you are concerned about any aspect of your academic program**

Make an appointment with a program counsellor in your degree program.

<http://www.bsc.uoguelph.ca/index.shtml> or  
<https://www.uoguelph.ca/uaic/programcounsellors>

##### **If you are struggling to succeed academically**

There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist. <http://www.learningcommons.uoguelph.ca/>

##### **If you are struggling with personal or health issues:**

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.  
<https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention.  
<https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.uoguelph.ca/~ksomers/>

##### **If you have a documented disability or think you may have a disability:**

The Centre for Students with Disabilities (CSD) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the centre please see: <https://www.uoguelph.ca/csd/>

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<b>SAFETY IN ECOLOGY FIELD COURSES AT THE UNIVERSITY OF GUELPH</b>	
<p>Many of the courses at this University involve field work in natural or semi-natural settings. Students must understand the distribution of responsibilities when this work is carried out. The University seeks to provide opportunities for an optimum training and educational experience, but it is the student's responsibility to effectively and safely exploit this opportunity. To this end, here we list the kinds of field settings to be encountered, and the attendant risks involved with these settings. We also list a series of mandatory behaviours that will ensure that the field exercises are conducted safely. Lastly, we include a requirement to sign and return the last page to us, as a written agreement on your part to follow the mandatory behaviours and accept the responsibility for any deviations from them.</p>	
Location	Risks and measures to avoid them
Forest and Grassland	<ul style="list-style-type: none"> <li>-Meeting cars while walking on road. Stay to side.</li> <li>-Poison ivy. Learn what it looks like and avoid. If contact is made, wash skin and clothing as soon as possible.</li> <li>-Bees. If you are stung, contact one of the course staff immediately. This is especially important if you have disturbed a colony! If you are allergic to bee stings, contact the staff at the beginning of the course.</li> <li>-Tree branches, twigs, logs, dead snags. All of these can either fall on you, cause you to trip and fall, or otherwise injure you. Do not pull on dead trees, or dead snags. Do not disturb coarse woody debris. Do not climb trees.</li> <li>-Glass on ground or in soil can cut you badly. Do not dig through soil with your hands. If you get cut, contact the staff immediately and seek appropriate medical attention.</li> <li>-Lightning. Do not conduct field work if there is lightning.</li> <li>-Other people. Assaults have been reported in the Dairy Bush, Arboretum, and other University Properties. Always travel with another person. Never conduct field work alone.</li> <li>-Animal bites. Do not encourage any vertebrate to approach you. This includes both wild and domestic animals.</li> <li>-Sunstroke. Wear a hat and sunblock if long periods of time are to be spent in the open. Bring water to drink.</li> </ul>
River	<ul style="list-style-type: none"> <li>-Any body of water can cause drowning. Always wear hip waders if so instructed. Never enter water alone. Respect powerful currents and slippery surfaces.</li> <li>-Cold. Even in the absence of a drowning risk, falling into cold water in the fall or winter can result in hypothermia. Do not fall into cold water. Do not enter cold water alone. If you do get wet, exit the water immediately and seek assistance from the staff.</li> <li>-Infections. The rivers of the Grand River watershed are not as clean as they used to be. Who knows what lurks in the water? Do not allow the water to get in your mouth. Do not allow open wounds to contact the water. Any illness associated with contact with the water should be reported to medical personnel.</li> <li>-Slippery rocks. Avoid stepping on uneven rocks. Walk slowly and carefully. If you have a fall that causes an injury, let the staff know immediately.</li> </ul>
Agricultural Fields	<ul style="list-style-type: none"> <li>-Farm equipment. Do not sample close to the ground in active or abandoned agricultural fields without making your presence known to people using farm machinery. Be alert to approaching machinery.</li> </ul>